

## HEAD MOTION ESTIMATION FROM FOUR FEATURE POINTS

### ABSTRACT OF THE DISCLOSURE

Linear method for performing head motion estimation from facial feature data, the method comprising the steps of: obtaining first facial image and detecting a head in the first image; detecting position of four points  $P$  of said first facial image where  $P = \{p_1, p_2, p_3, p_4\}$ , and  $p_k = (x_k, y_k)$ ; obtaining second facial image and detecting a head in the second image; detecting position of four points  $P'$  of the second facial image where  $P' = \{p'_1, p'_2, p'_3, p'_4\}$  and  $p'_k = (x'_k, y'_k)$ ; and, determining the motion of the head represented by a rotation matrix  $R$  and translation vector  $T$  using the points  $P$  and  $P'$ .

The head motion estimation is governed according to an equation:

$$P'_i = RP_i + T, \quad \text{where } R = \begin{bmatrix} \mathbf{r}_1^T \\ \mathbf{r}_2^T \\ \mathbf{r}_3^T \end{bmatrix} = [r_{ij}]_{3 \times 3} \quad \text{and } T = [T_1 \ T_2 \ T_3]^T$$

represents camera rotation and translation respectively.